E-1232

SOYBEAN INSECTS

Soybean Aphid, *Aphis glycines*, Management in North Dakota - 2002

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Soybean aphid, *Aphis glycines*, was found in the eastern counties of North Dakota in August 2001. Though no economic infestations were found in North Dakota during the 2001 season, there is great potential for yield losses in 2002. Field scouting to look for aphids is strongly recommended. Failure to do so could result in significant yield losses. Minnesota and Wisconsin researchers reported losses ranging from 0 to 17 bushels per acre in their untreated plots from 2001 insecticide control trials.

The original discovery of soybean aphid was in July and early August of 2000 where it was found feeding on soybeans in the midwestern states of Michigan, Illinois, Wisconsin, Iowa, and southeastern Minnesota. The aphid spread rapidly in 2001. The soybean aphid, native to Asia, had never been reported in the United States prior to this discovery.

Description

Soybean aphids are small (approximately 1/16 inch long) soft-bodied insects and may be winged or wingless. Nymphs can be much smaller than adults. The soybean aphid is light yellow with black cornicles ("tail-pipes") and a pale colored cauda (tail projection). Winged adults will have a black head and thorax. In mid August the aphids are often lighter in color.

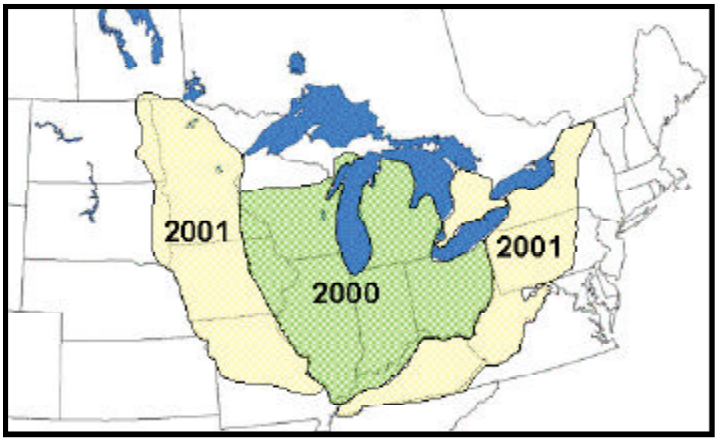

Figure 1. Soybean aphid distribution in the central US and areas of Canada from the years 2000 and 2001.

Figure 2. Soybean aphid adults and nymphs.

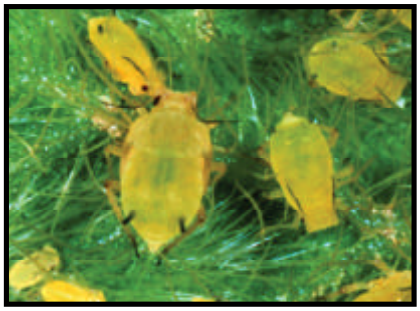

Figure 3. Closeup of soybean aphids.

Figure 4. Winged soybean aphid adult.

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Figure 5. Common Buckthorn (*Rhamnus cathartica*). Leaves are dark green and glossy with three to four pairs of upturned veins. Green leaves often remain on tree well into the fall. Small, yellow-green flowers are clustered at the base of leaves in spring.

Life Cycle

The soybean aphid can survive winter only in the egg stage, as is true of other aphids in temperate zones. Buckthorn *(Rhamnus* spp.) is the only known overwintering host. Aphid eggs are very winter hardy and can survive extended periods of very cold temperatures. Soybean aphids hatch in the spring and are expected to have two to three generations of wingless females before a winged generation leaves the overwintering host in search of soybean. Numerous generations of wingless females will develop on soybeans before a winged generation of females and males migrate back to buckthorn in late-summer/early fall to mate and lay eggs.

Damage

Aphids suck sap from plants. When infestations are large, infested leaves are wilted or curled. Other symptoms of direct feeding damage may include plant stunting, reduced pod and seed counts, puckering and yellowing of leaves. The aphids excrete honeydew, a sweet substance that accumulates on surfaces of lower leaves and promotes the growth of sooty mold. This aphid colonizes tender leaves and branches from seedling to blooming. Later, as the growing point slows, the aphids slow their reproductive rate, move down to the middle and lower part of the plant, and feed on the undersides of leaves, stems, and pods. Toward the end of the season the colonies begin to rapidly increase in number again. These increases are followed by the migration back to buckthorn.

Soybean aphids are capable of transmitting viruses during the feeding process. Several important viruses include alfalfa mosaic, soybean mosaic and bean yellow mosaic. These viruses commonly occur together and form a complex. Symptoms are frequently associated with specific fields and not all fields in a region. General symptoms of soybean viruses include plant stunting, leaf distortion and mottling, reduced pod numbers and seed discoloration. Forage legumes are important sources of inoculum for alfalfa mosaic virus. Infected seed is the most important means for introducing soybean mosaic virus into a field. These viruses occur at a very low incidence in North Dakota. They may become more important in the future with the establishment of the soybean aphid.

Management Recommendations

Treatment Threshold and Spray Timing

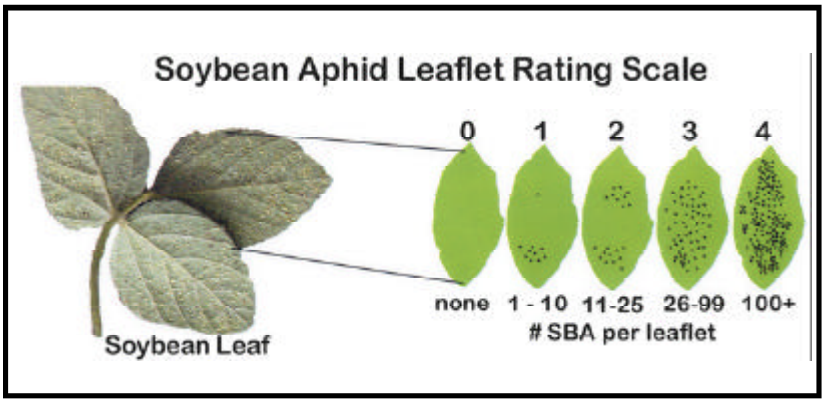
Unfortunately, the treatment threshold is still vague, and future research and experience will better define it. Currently, the guidelines for making soybean aphid treatment decisions are:

- Begin scouting soybean fields at the V3 to V4 stage to determine if soybean aphids are present in fields. No treatment is recommended at this time and is discouraged so insecticides do not reduce the presence of predators and parasites.
- The critical growth stage for making most soybean aphid treatment decisions appears to be the late vegetative to early reproductive (V*n* to R2). Assessing aphid populations at this time is critical. Conclusions from 2001 management programs in Wisconsin, Minnesota and Michigan find that the best results from an aphid treatment occurred from mid July to early August.
- **Treatment to manage soybean aphid would be recommended at early flowering (*R1 to R2*) when aphids are abundant on most plants (*guideline: aphids number 25 or more per sampled leaflet*).** University of Wisconsin research trials during 2001 found that a population of 200 aphids/plant during susceptible growth stages (R2 to R4) resulted in a yield loss of about 6 bushels/acre, a yield loss near or above the break-even point for the cost of an insecticide application.

Figure 6. Beginning Bloom (R1) and Full Bloom (R2). R1 is when at least one flower is found on the plant at any node, usually the third to sixth, on the main stem. R2 is when an open flower is seen at one of the two top nodes of the main stem. (For more information see NDSU circular A-1174, Soybean Growth and Management Quick Guide)

Suggested Sampling Procedure

The following sampling procedure has been suggested by DiFonzo and Hines (2002) based on field experience from the 2001 production year. As populations increased in 2001, they found the easiest way to sample for soybean aphid was to evaluate individual leaflets on a 0 to 4 scale. This sampling method proved useful when evaluating fields before and after spraying. Using this scale, leaflets can be quickly rated without counting individual aphids. The leaflet in the example is clearly a "4" on the scale. **When the average leaf rating is 3 or greater, and other conditions are met, treatment would be advised.**



Natural Management

Intense rainfall may kill many aphids by dislodging them from the plant. High humidity that follows rains should increase the potential for aphid fungal infections.

Numerous predators and parasites attack aphids. Important predators of the soybean aphid are lady beetle larvae, lacewing larvae, and predatory bugs. Evidence of parasitic wasp activity is the presence of aphid mummies on leaves scattered through the aphid colonies.

Aphid populations may decline rapidly in response to other factors. Crowding and declining quality of food resources often stimulate the development of winged adult aphids. There were numerous cases reported in August 2001 where aphid populations declined rapidly as the aphids developed wings and migrated from those fields.

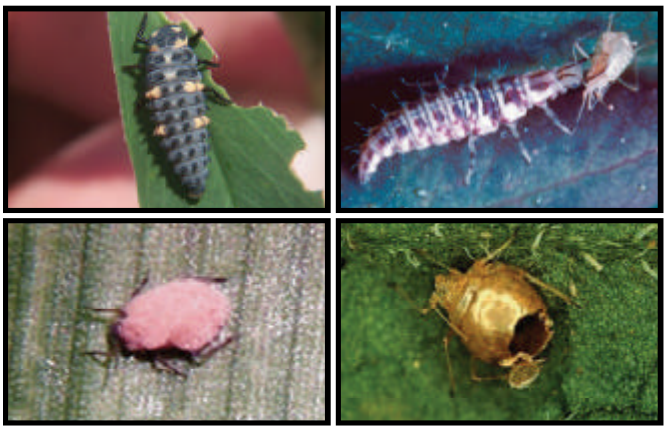


Figure 7. Clockwise from upper left: lady beetle larva, lacewing larva, aphid mummy, and fungus killed aphid.

Checklist for Soybean Aphid Spray Decision

Further suggestions for assessing aphid populations in fields this season are:

- **Aphid number –** Leaflet rating of at least 3.0.
- **Aphid appearance –** Aphids are healthy and fungus-infected aphids are not present. Infected aphids are pinkish, white or tan and fuzzy from the growth of fungi out of their bodies. When weather conditions are favorable, the fungi produce spores, which infect and kill other aphids. Once a fungal outbreak starts, an insecticide spray may not be needed.
- **Plant appearance –** Honeydew present on the leaves is a sign that aphid numbers are large. Sooty mold may grow on these surfaces.
- **Timing –** July is probably the most beneficial time to treat aphids. June is likely too early to make a spray decision. August may be getting too late to get the most yield advantage from treatment.
- **Weather conditions –** If dry conditions occur, fungal infections will be low. If warm, humid weather occurs, fungal pathogens are most active and have the best chance of reducing aphid numbers.
- **Plant stage –** Flowering and early pod fill seem to be critical times for aphid control. Large numbers of aphids feeding on soybean may cause flowers and pods to abort. Spraying later in the season after pods are formed may be too late to gain yield equal to the cost of treatment.

Registered Soybean Aphid Insecticides

Insecticide	Dosage in Lb Ai/acre	Product Per Acre	Restrictions on Use
Asana XL *RUP*	0.03 to 0.05	5.8 to 9.6 fl oz	Do not apply within 21 days of harvest. Do not feed or graze livestock on treated plants.
Furadan 4F *RUP*	0.25 to 0.5	4 to 8 fl oz	Do not apply within 21 days of harvest. Apply in sufficient water for thorough coverage (minimum gallons: air - 2 gal/acre, ground - 20 gal/acre).
Lorsban 4E *RUP*	0.5 to 1.0	1 to 2 pts	Do not apply within 28 days of harvest. Do not graze or feed forage to dairy or meat animals within 14 days after application. Do not feed straw from treated soybeans to meat or dairy animals within 28 days after application.
Mustang *RUP*	0.035 to 0.05	3.0 to 4.3 fl oz	Do not apply within 21 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Use a minimum of 2 gal finished spray by air or 10 gal finished spray by ground.
Penncap-M *RUP*	0.25 to 0.75	1 to 3 pts	Do not apply within 20 days of harvest. Do not make more than two applications per season.
Pounce *RUP*	0.1 to 0.2	4 to 8 fl oz	Do not apply within 60 days of harvest. Do not feed or graze livestock on treated plants.
Warrior *RUP*	0.015 to 0.025	1.92 to 3.2 fl oz	Do not apply within 45 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre.

RUP - Restricted use pesticide

Additional References

DiFonzo, C, and R. Hines. 2002. Soybean Aphid in Michigan: Update from the 2001 season. Michigan State University Extension Bulletin E-2748.

Grau, C., B. Jensen, S. Myers, and J. Wedberg. 2002. Soybean Aphid. University of Wisconsin Extension, Team Grains Publication 1:1, 2002.

Photo Credits

Figures 2, 3, and 4 courtesy of Dr. David J. Voegtlin, Center for Biodiversity, Illinois Natural History Survey.

Figure 5 lacewing larva courtesy of Texas Forest Service Archives, Texas Forest Service. Image 3227003. ForestryImages.org. http://www.forestryimages.org/. May 31, 2002.

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